# Develop And Design a Laboratory Scale Stand-Alone Micro grid Using Hybrid Energy Resources

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**ABSTRACT:** In this work, a control strategy for power flow management of a grid-connected hybrid photovoltaic (PV)–wind based system and battery with an efficient multi-input transformer coupled bidirectional DC–AC converter is presented. The system aims to satisfy the load demand, manage the power flow from different sources, inject the surplus power into the grid when required. A transformer-coupled boost half-bridge converter is used to harness power from wind, while a bidirectional buck-boost converter is used to harness power from PV. This system is mainly focused on improving the dc-link voltage regulation. The series or parallel configuration can be extended at the output to derive multiport DC–AC converters. A multi-input dc/dc converter based on the flux additively is proposed in this paper. Instead of combining input dc sources in the electric form, the proposed converter combines input dc sources in magnetic form by adding up the produced magnetic flux together in the magnetic core of the coupled transformer. With the phase-shifted pulse-width-modulation (PWM) control, the proposed converter can draw power from two different dc sources and deliver it to the load individually and simultaneously. The operation principle of the proposed converter has been analyzed in detail. The output voltage regulation and power flow control can be achieved by the phase-shifted PWM control. A prototype converter with two different dc voltage sources has been successfully implemented. Computer simulations and hardware experimental results are presented to verify the performance of the proposed multi-input dc-ac converter.

## 1. INTRODUCTION

The solar energy and wind energy are doing a main role in the clean energy production. We use the some power electronic converters like that AC-DC, DC-AC, DC-DC which is used to improve the system performance. This system is mainly used for the educational and research centers. In addition to we use the multi-input transformer coupled with DC-AC converter. Hence, it is a challenge to supply stable and continuous power using these sources. We using the voltage regulator in the solar panel output side because regulate the voltage and to provide the stable or constant supply to load side. Significant amount of literature exists on the integration of solar and wind energy as a hybrid energy generation system with focus mainly on its sizing and optimization in hybrid system is investigated.

In this framework, the sources and capacity are interfaces at the dc interface, through their committed converters. Other commitments are made on their modeling perspectives and control strategies for a stand-alone cross breed vitality framework. Energetic execution of a stand-alone cross breed PV-wind framework with battery capacity is analyzed. Not numerous endeavors are made to optimize the circuit arrangement of these frameworks that may diminish the taken a toll and increment the effectiveness and unwavering quality of the dc loads, a moo capacity multi-port converter for a crossbreed framework is displayed. Crossover PV-wind based era of power and its interface with the control lattice are the critical inquiry about zones. A multi-input cross breed PVwind control era framework which incorporates a buck/buck-boost melded multi-input dc-ac converter and a full-bridge dc-ac inverter. This framework is mainly focused on moving forward the dc-link voltage control. Within the six-arm converter topology the yields of a PV cluster and wind generators

## II. Proposed system architecture

The photovoltaic cell is a device which is used to directly convert the light energy into dc electrical energy with help of photovoltaic effect and this solar panel output is connected to the microgrid. The wind-turbine system is produced the electricity which is connected to the mirogrid.

Finally the microgrid output is going to be multi-input-transformer coupled bidirectional DC-AC converter which converts the DC voltage into AC voltage. This AC output energy is fed to the voltage regulator circuit which generate the constant output voltage to the load. The battery is acts as storage system which is used to store the DC energy. The DC load is going to be consume the DC supply from of battery.

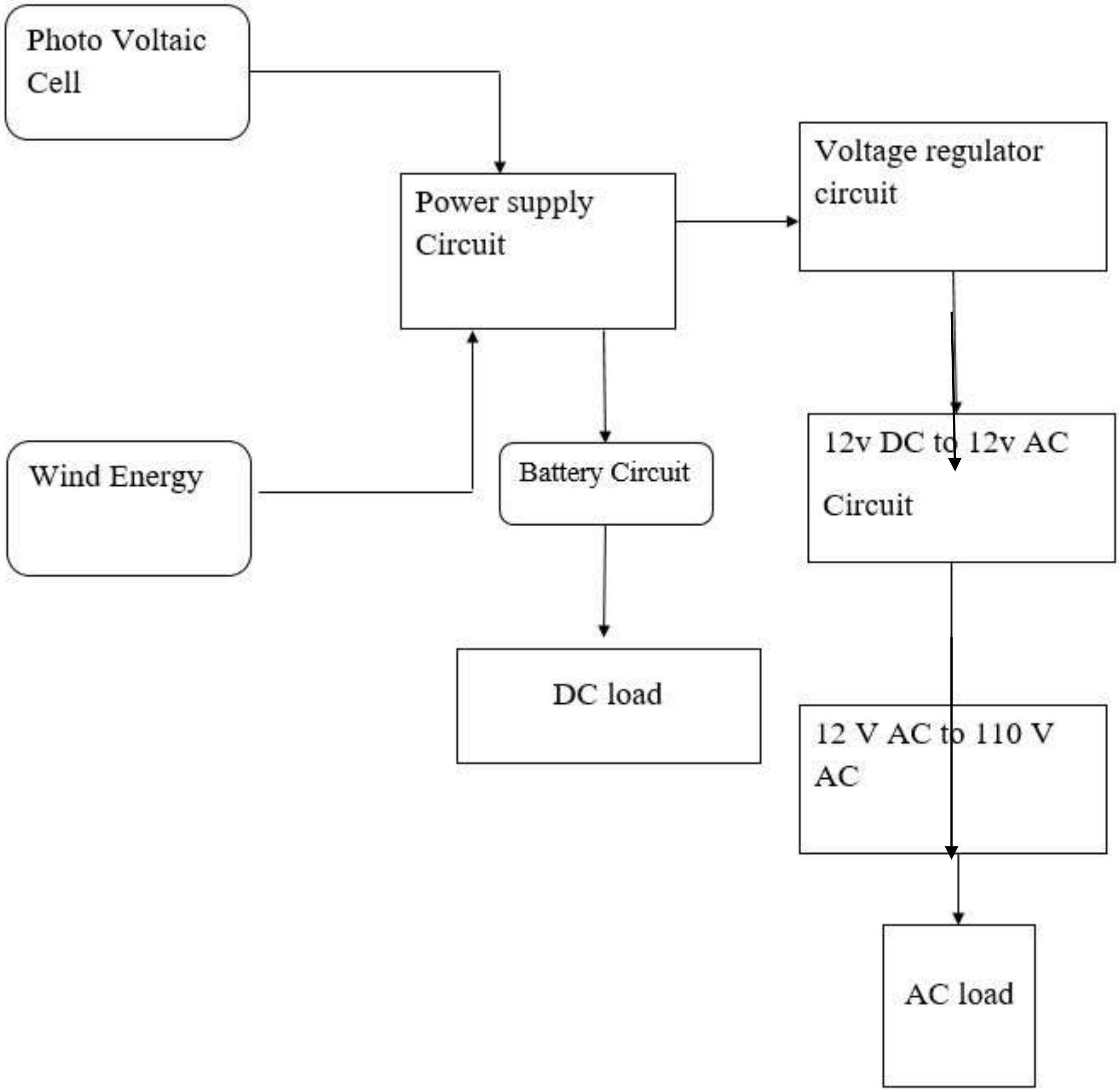


Fig1. Block diagram of proposed system

The purpose of the inverter is to convert the DC voltage into AC voltage with help of the voltage source inverter.

### III. Circuit diagram:

The proposed multi-input power converter consists of a Cuk fused multi-input DC-DC converter and a full bridge dc– ac inverter. The incremental conductance method is mainly used to accomplish the maximum power point tracking (MPPT) algorithm for input sources. The operational principle of the proposed multi-input power converter is explained.

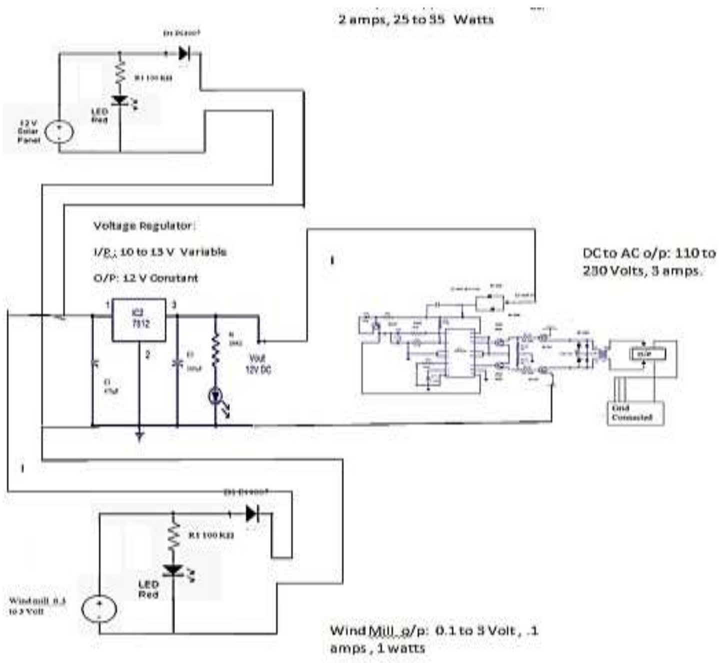


Fig2. Circuit diagram of proposed system

A multi-input power converter (MIPC) which operates in four modes: first an operation type wherein power is delivered to dc Bus from hybrid renewable energy sources; second a single type wherein only one renewable energy source supplies power to the dc Bus; third and inverter type wherein power is delivered to dc Bus from ac grid via inverter module, and forth a battery type where in power is delivered to dc Bus from batteries and renewable energy source. The integration of the dc Bus and a hybrid renewable power supply system is implemented and simulated using MATLAB/SIMULINK.

## IV. SIMULATION RESULT:

### 4.1 THREE PHASE AC VOLTAGE OUTPUT:

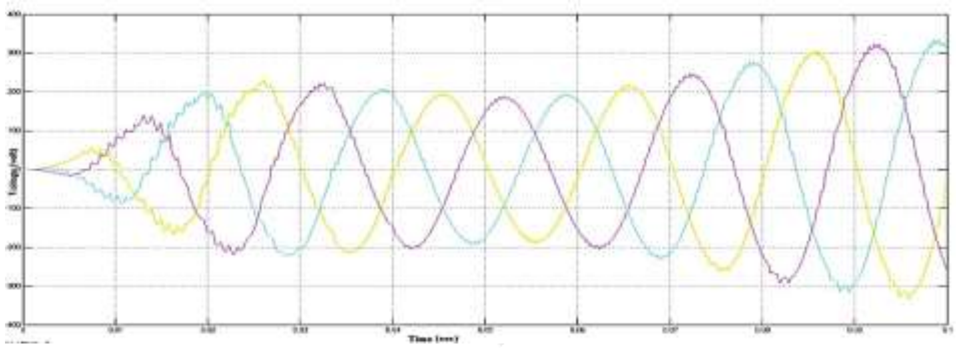

Fig3. Three Phase Ac Voltage Waveform

The Figure 3 represents the waveform of output voltage of the wind pv hybrid system. X axis represents the time in millisecond and y axis represents the voltage. The three phase represents in R Y B . Each phase has a phase shift of 120 degree. The power quality of the waveform is degraded because it has harmonics.

**4.2 SOLAR PANEL OUTPUT:**

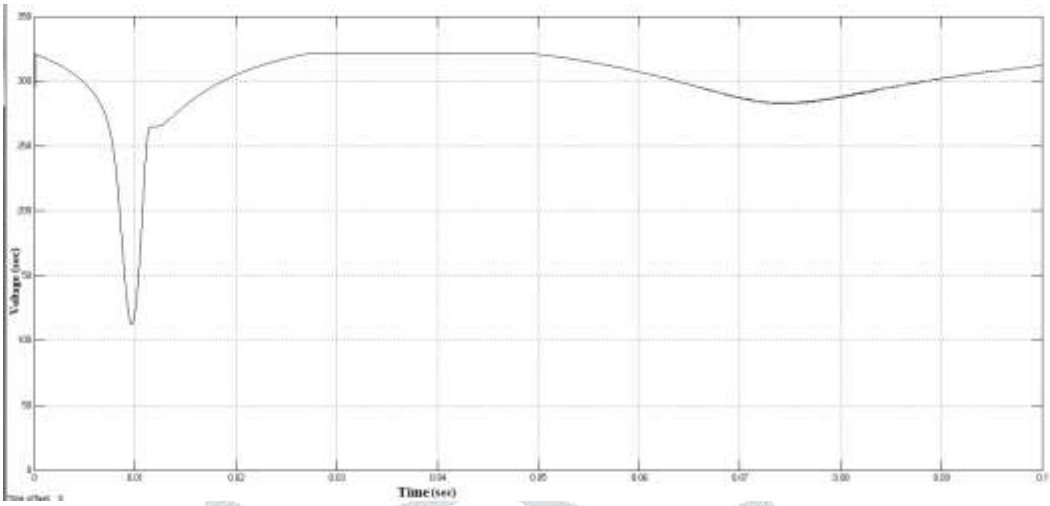


Fig4. Solar panel output waveform

The figure4 shows the solar panel dc output. The output is varied according to the irradiance .Dc-dc boost converter is used to improve the solar dc outputs. The X axis represents the time in mille seconds and the Y-axis represents the voltage in terms of volt. The solar panel output is fed into the boost converter for maintaining a constant output voltage.

**4.3 MPPT OUTPUT:**

The Fig.5 represents the switching pulse of boost converter which is generated from maximum power point tracking technique (MPPT) using incremental conductance algorithm. The MPPT technique is used to detect the peak point of power curve. The x- axis represents the time in mille seconds and the Y- axis represents the voltage in terms of volt.

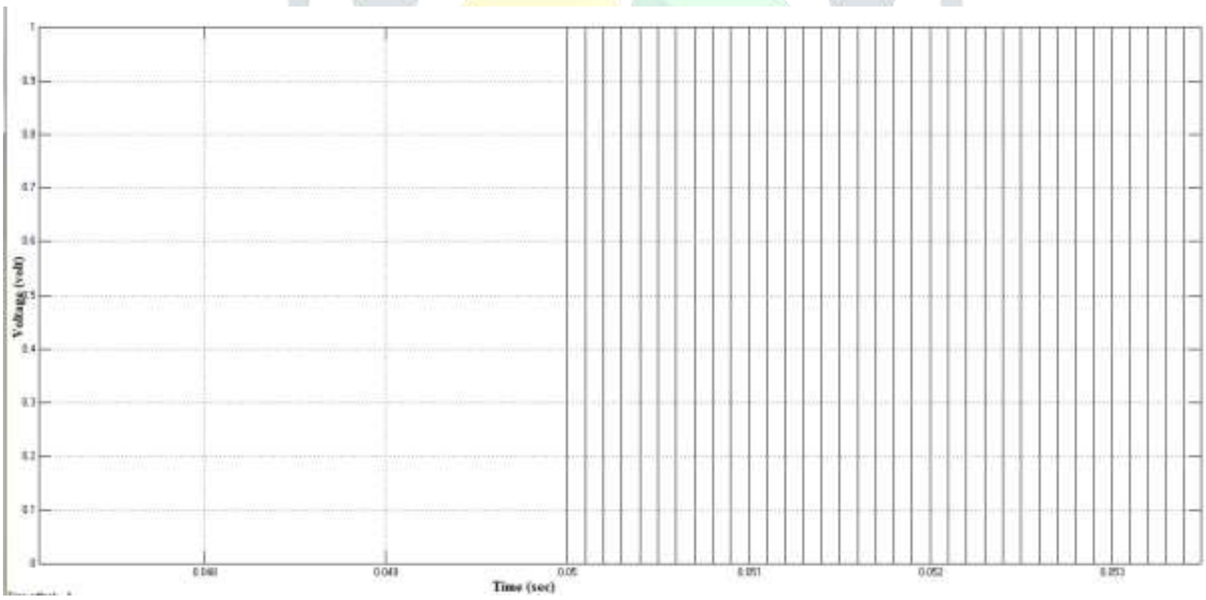


Fig.5 MPPT output waveforms

**4.4 GRID OUTPUT:**

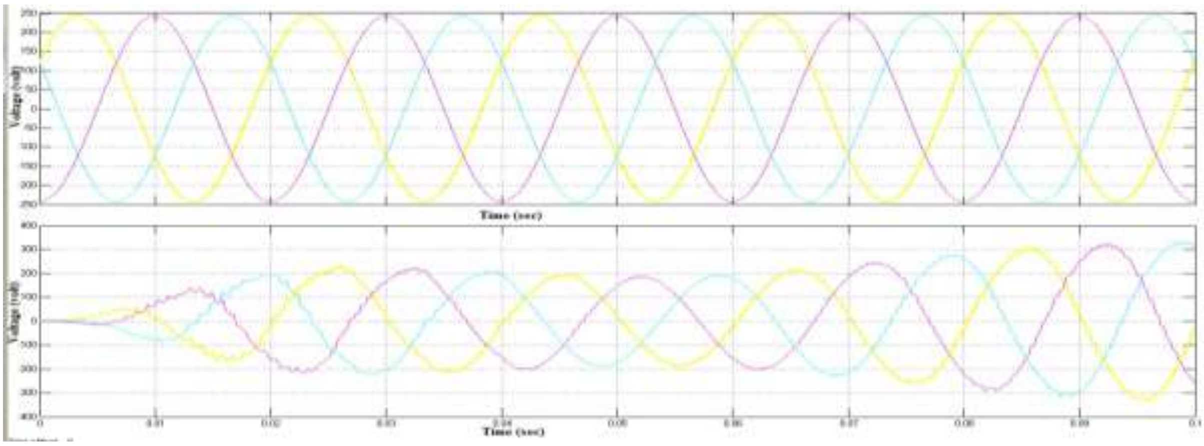

Fig6. Grid output waveforms

The Fig6. represents the grid voltage. The X axis represents the time in mille second (ms) and the Y axis represents the voltage in terms of volt. The each phase has 120 degree phase difference.

**4.5 HARDWARE DIAGRAM:**

Fig7. Hardware Diagram

The hardware development of the entire system shown in matlab-simulink environment in figure 3 is shown in Fig 7.

## V. Conclusion:

Grid-connected half breed PV– wind-based control departure conspire is an exquisite integration of PV and wind source to extricate the greatest vitality. It is realized by a novel multi-input transformer coupled bidirectional DC- AC converter taken after by a routine full-bridge inverter. A flexible control procedure which accomplishes distant better; a much better; a higher; a stronger; an improved"a distant better utilization of PV, wind control, battery capacities and control stream administration in a grid-connected cross breed PV–wind-battery-based framework bolstering ac loads is displayed. The reenactment comes about and test results are steady in illustrating the capability of the framework to function either in lattice nourishing or in stand-alone modes. The setup is able of providing uninterruptible control to ac loads and guarantees the clearing of excess PV and wind control into the framework.

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